# Recent Verifications of Climate Prediction Center (CPC) Extended Range Outlooks

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NOAA/NWS/NCEP/CPC
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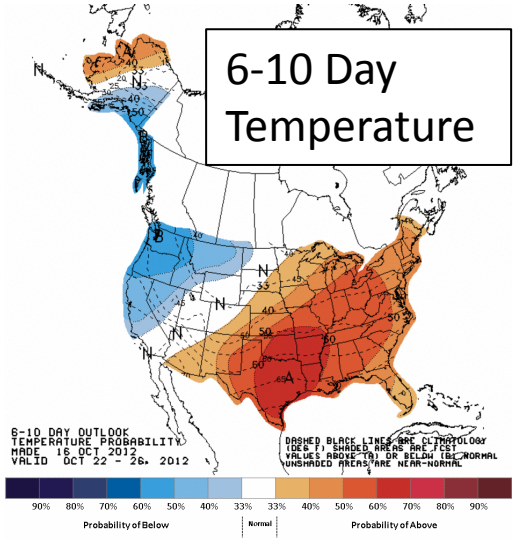
# Acknowledgements

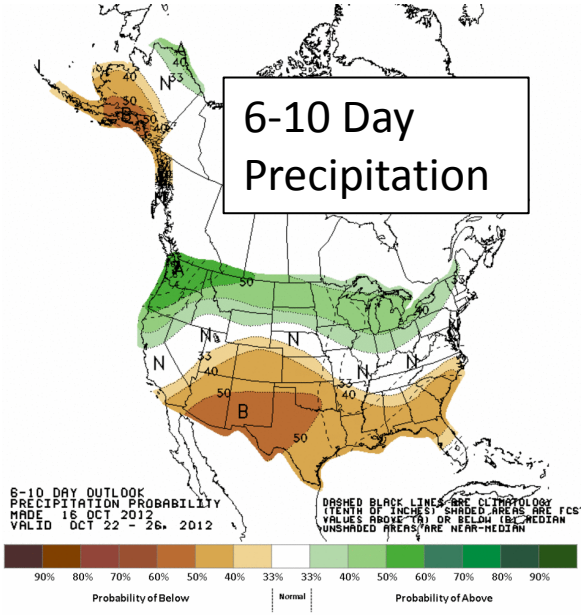

- Adam Allgood
- David Unger
- Jon Gottschalck
- Ed Olenic
- Melissa Ou
- Mike Charles
- Sarah Marquardt

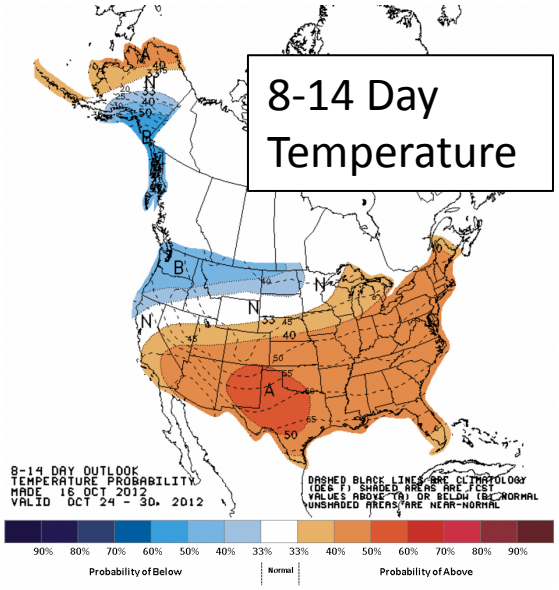
# Outline

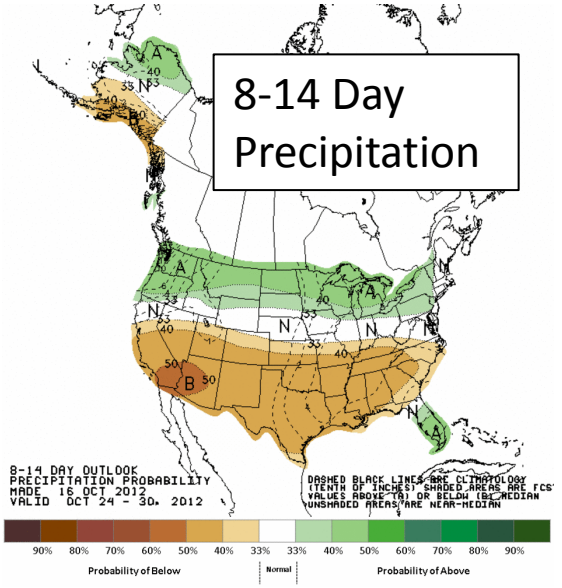
- Overview of forecasts, observations, and verification methods
- Summary of Verification Statistics
- Verification Resources Available to the Public

# Extended Range Forecasts Verified



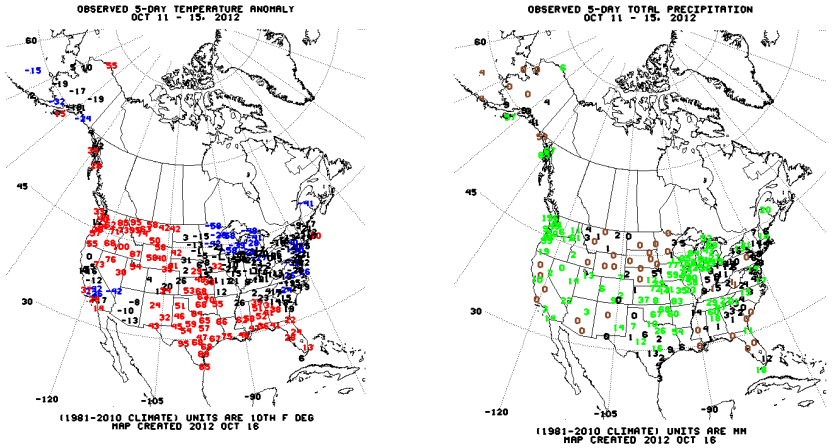




Note: Class limits determined by 30 Year Climatology (currently 1981-2010)

# Observations Used

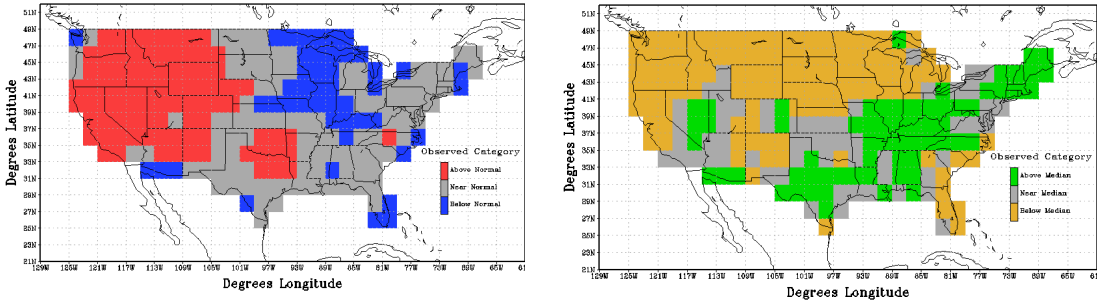
## Station Temperature and Precipitation Observations




Source: Climate Assessment Database (CADB)

Station List: 1st Order WMO Stations

## Gridded Temperature and Precipitation Observations




Temperature Sources: River Forecast Centers (RFC) and Climate Assessment Database (CADB)

Precipitation Source: CPC Unified Gauge-Based Analysis

# Verification Metrics

**Metric**: Heidke Skill Score (HSS)
**Forecast Type**: Deterministic (Favored Category)
**Range**: -50 to 100 (3 Class System)

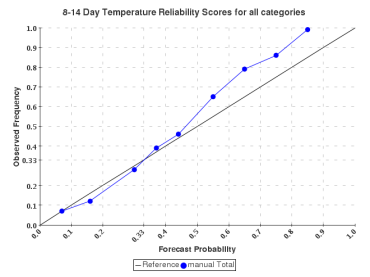
**HSS (%) = 100 * (H - E) / (T - E)**
where H = Number of correct forecasts, E = Expected number of correct forecasts (1/3 of total), and T = Total number of valid forecast-observation pairs

**Metric**: Rank Probability Skill Score (RPSS)
**Forecast Type**: Probabilistic
**Range**: up to 1.0

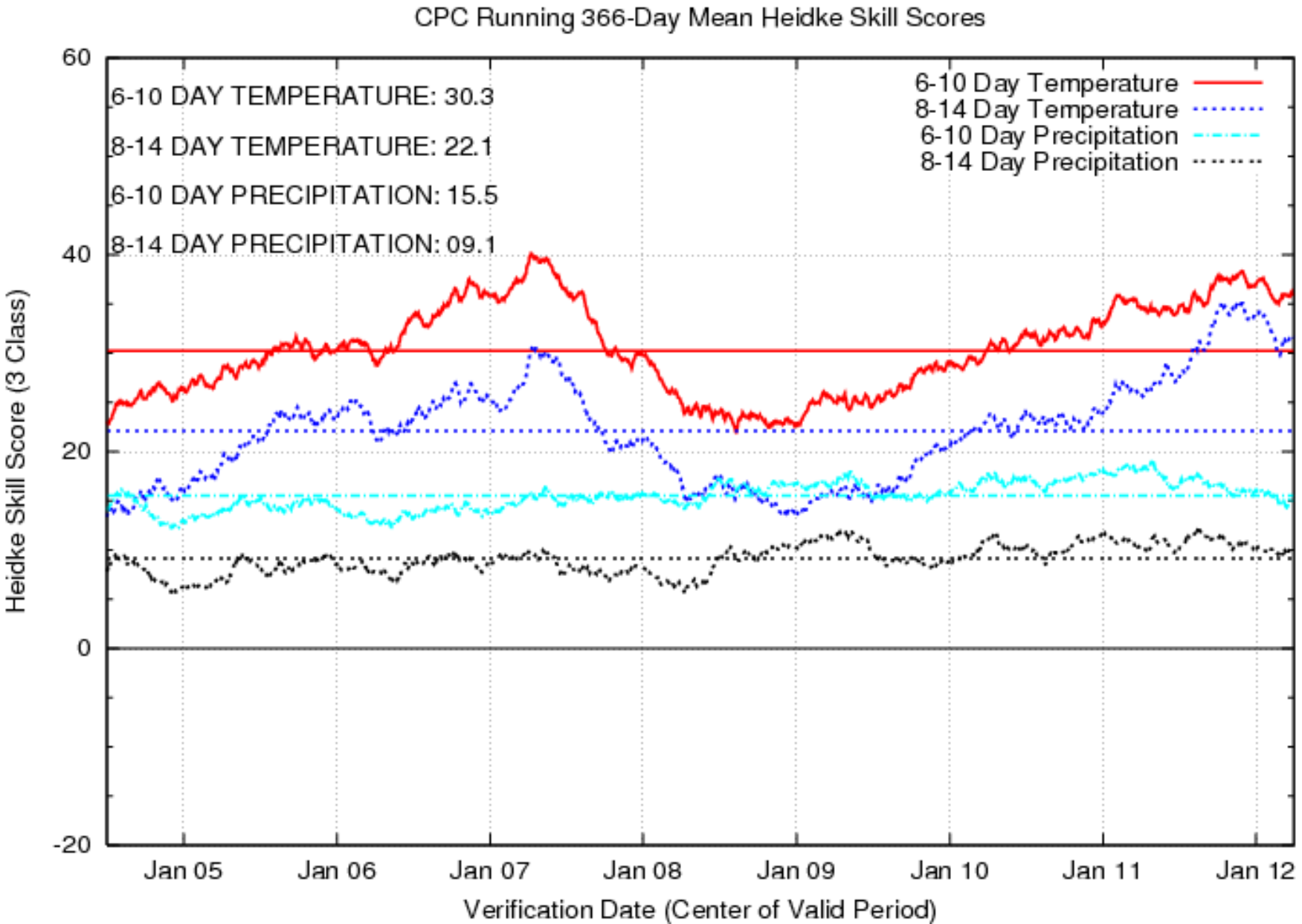
**RPSS = 1 - RPSforecast/RPSreference**

Where:
RPS = 1/n * SUM[(probB(k)-obsB(k))^2 + (probN(k)-obsN(k))^2 + (probA(k)-obsA(k))^2]

**Metric**: Reliability Diagram
**Forecast Type**: Probabilistic (Frequency of Occurrence)



# Overview of ERF Skill (2004-2012)



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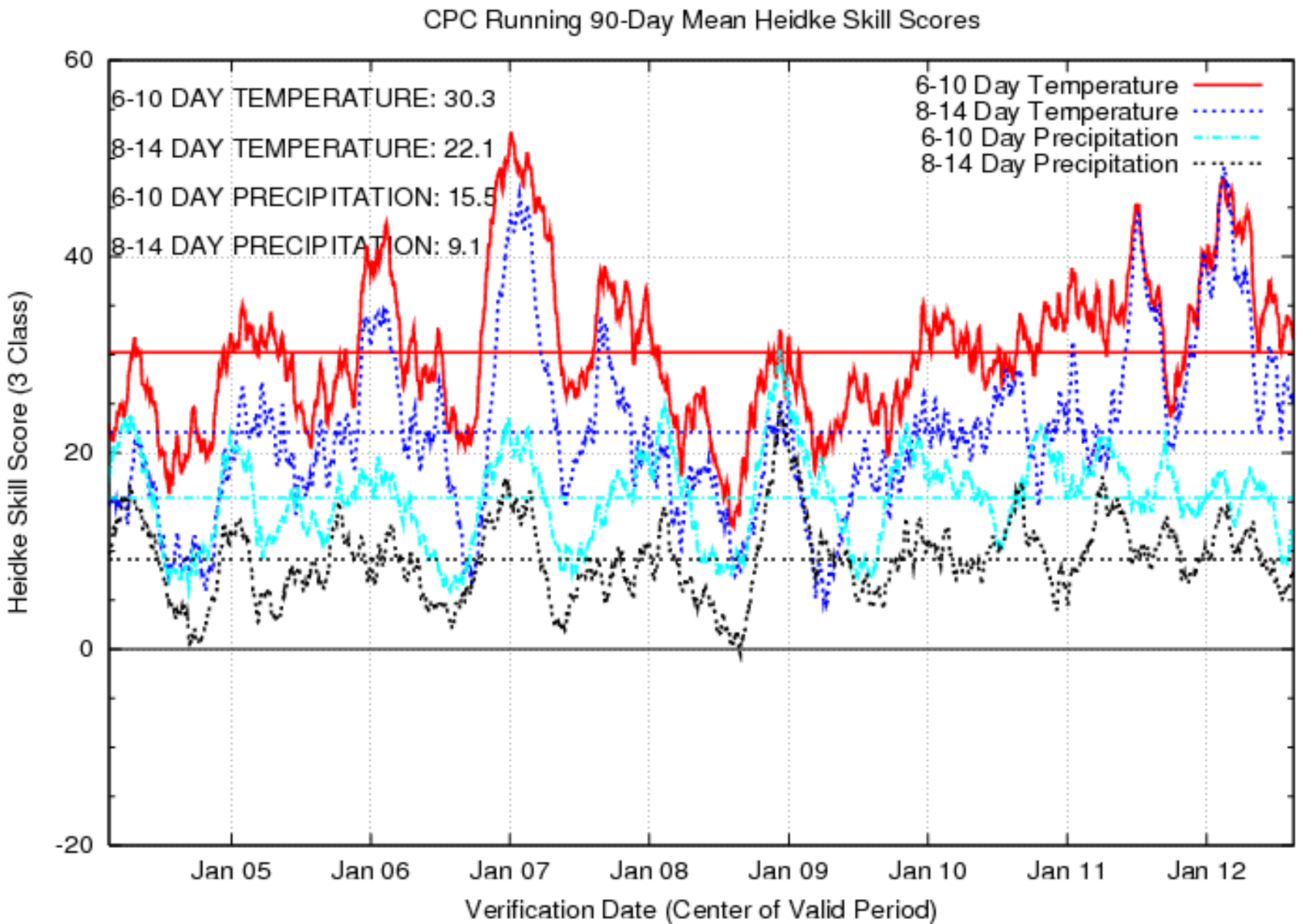
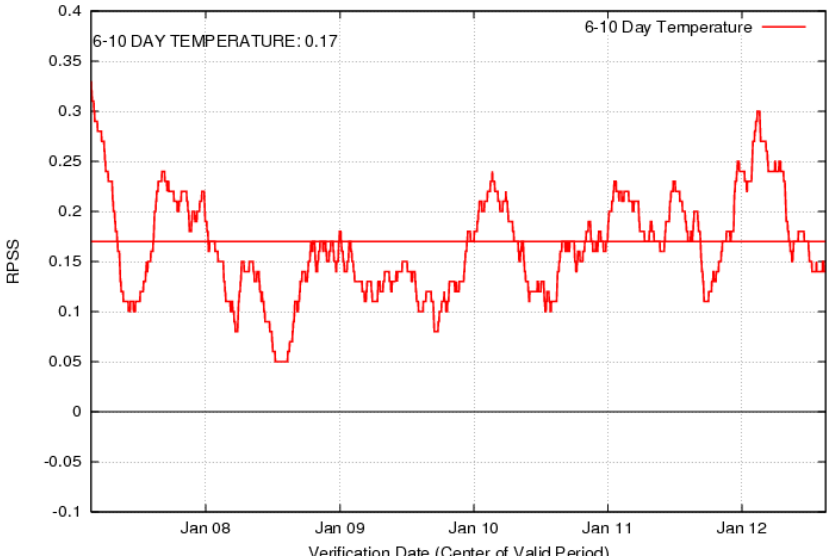
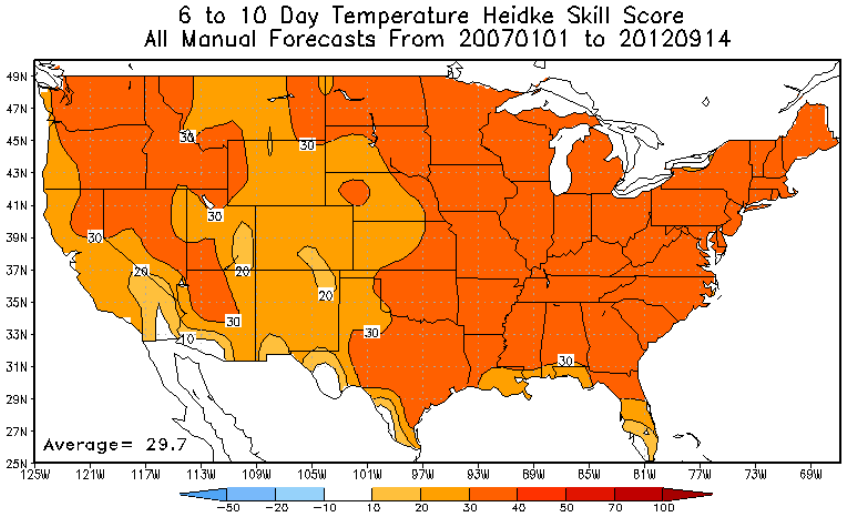


# 6-10 Day Temperature Skill (2007-2012)

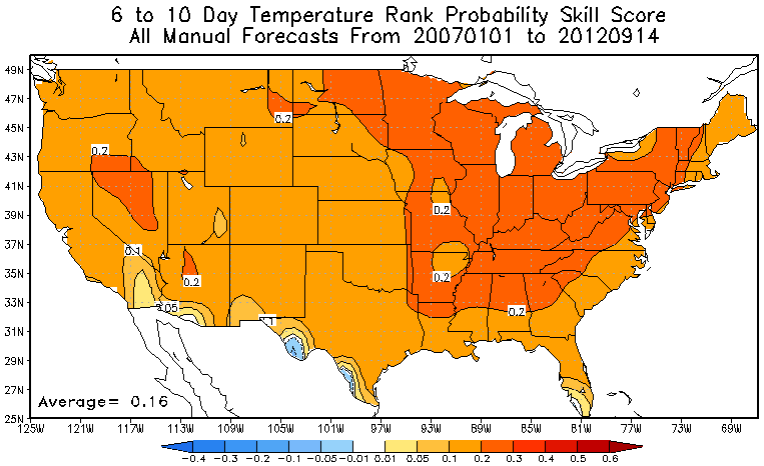
## RPSS (90 Day Running Mean)



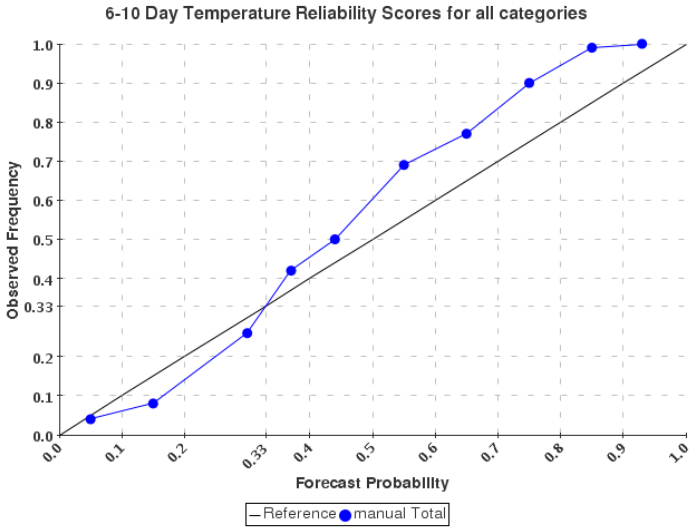

## Heidke




## RPSS

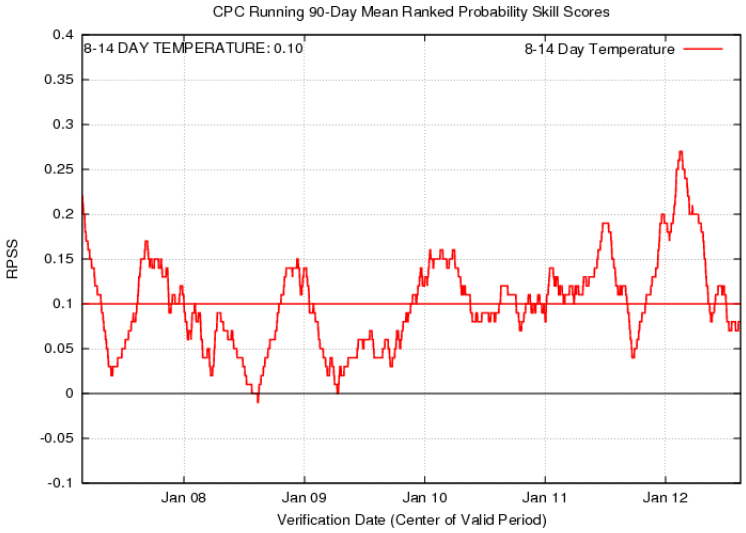



## Reliability

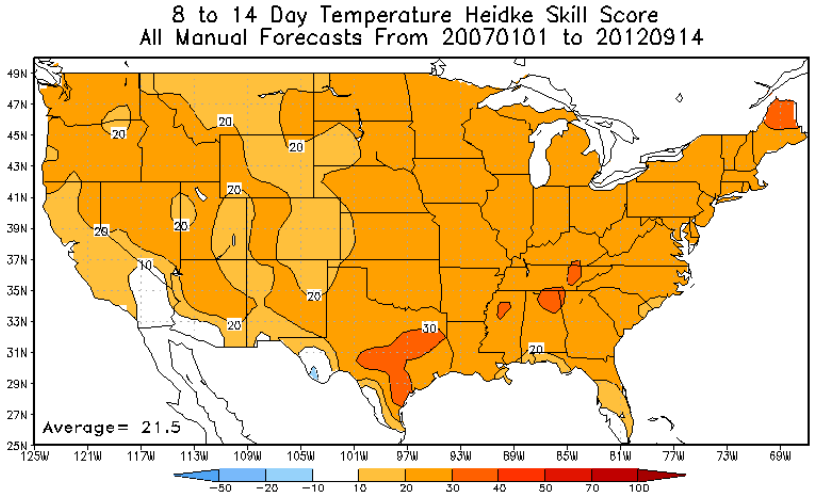


# 8-14 Day Temperature Skill (2007-2012)

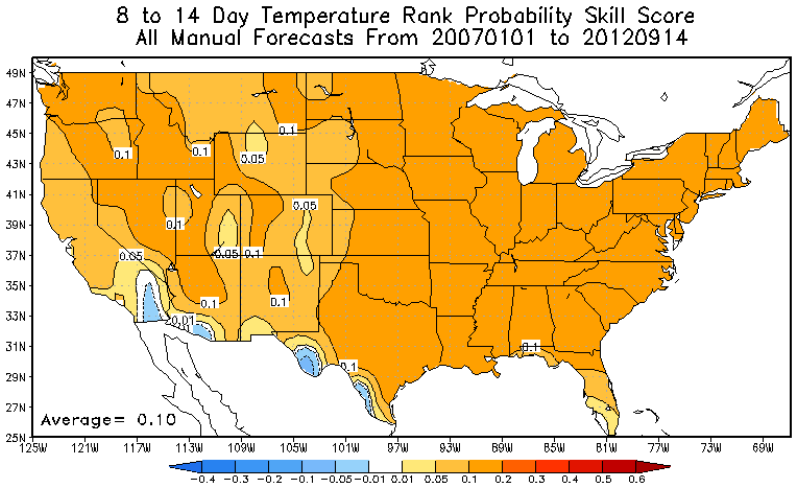
## RPSS (90 Day Running Mean)



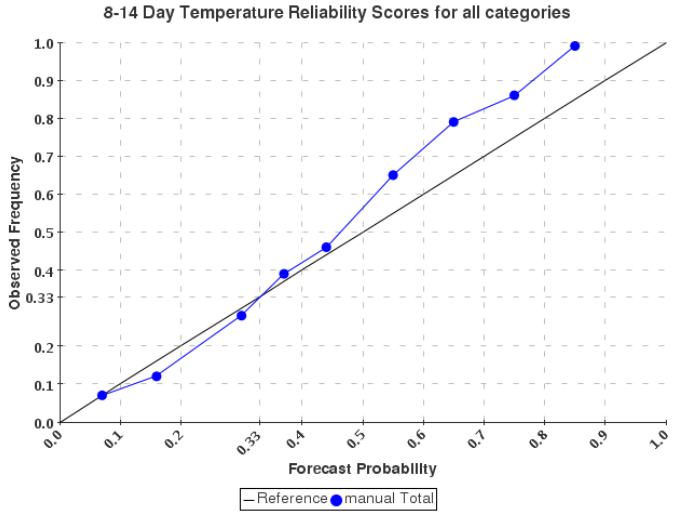

## Heidke




## RPSS

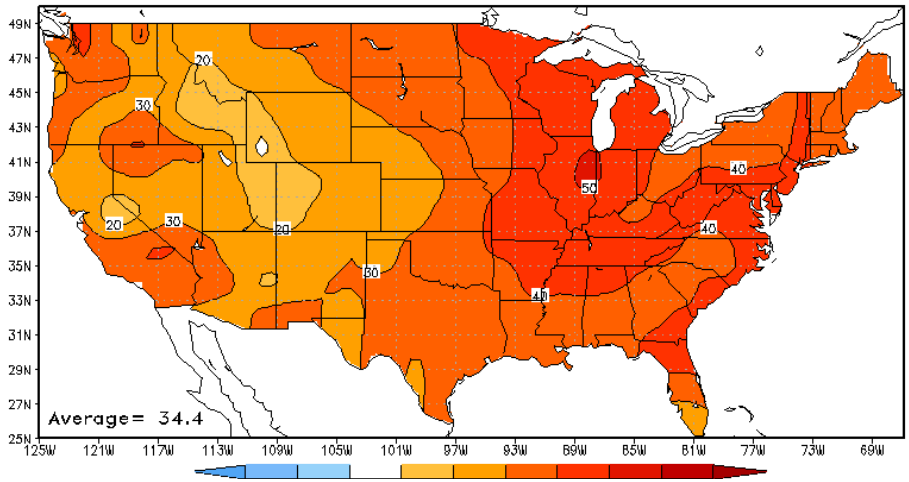



## Reliability

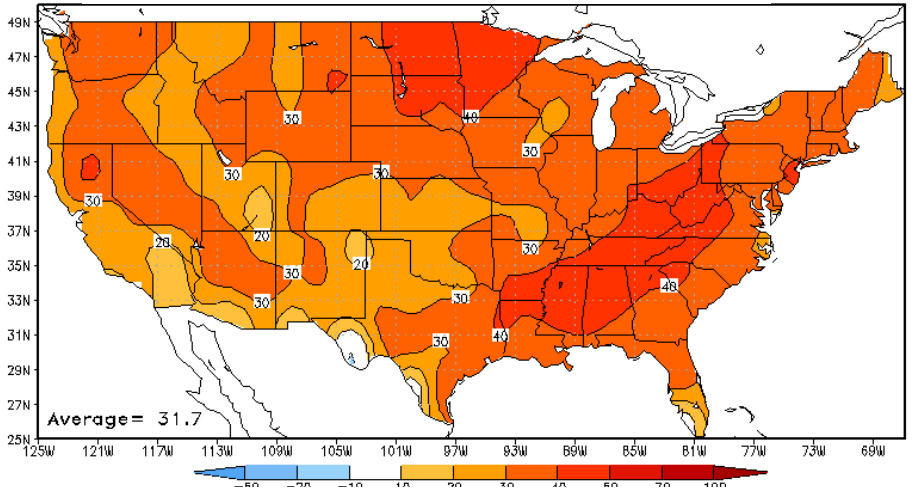


# 6-10 Day Temperature Heidke Skill By Season (2007-2012)

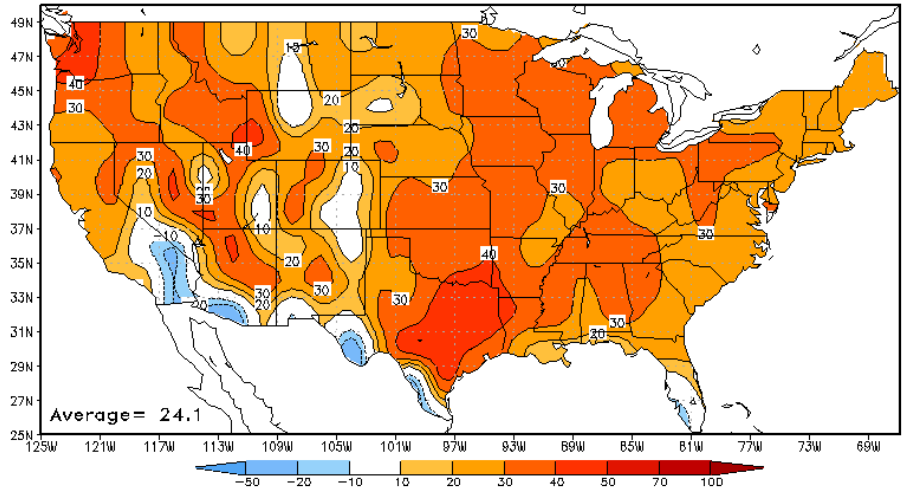
## Winter



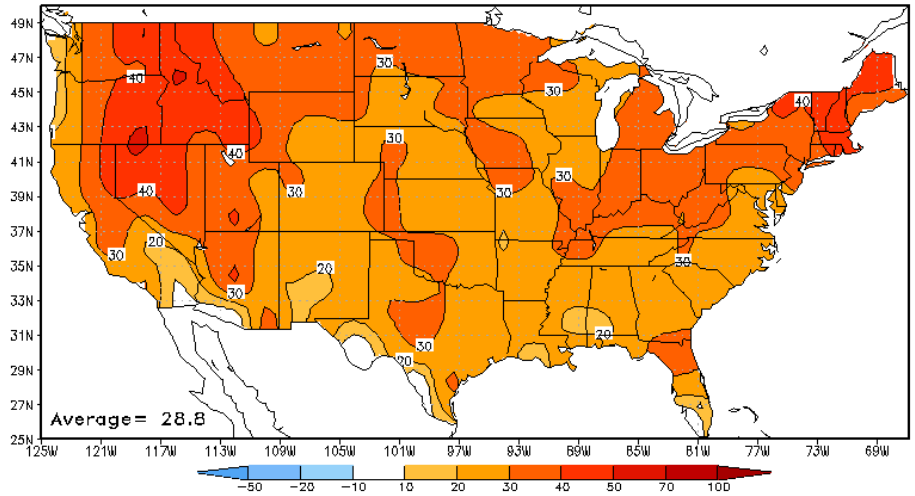

## Spring




## Summer

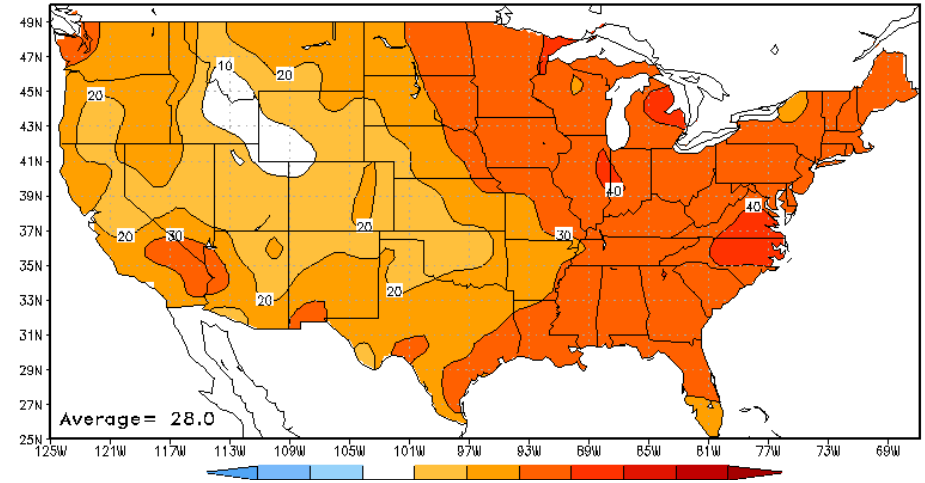



## Fall

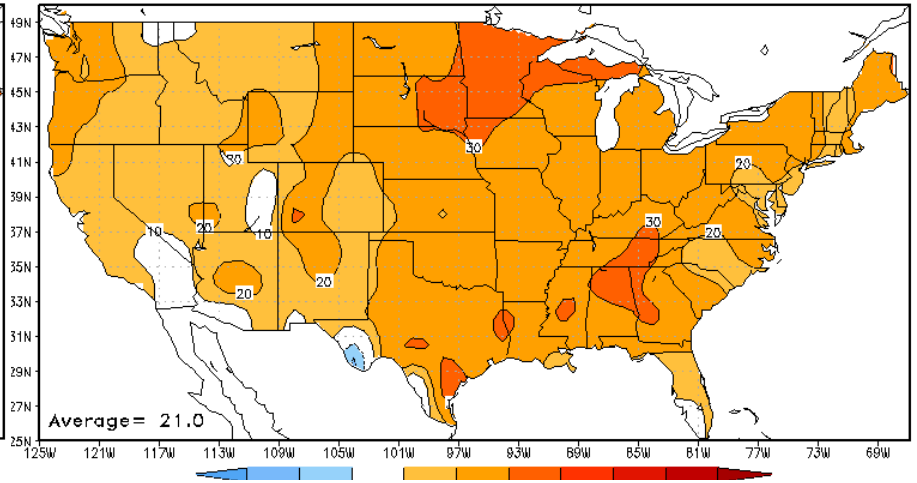


# 8-14 Day Temperature Heidke Skill By Season (2007-2012)

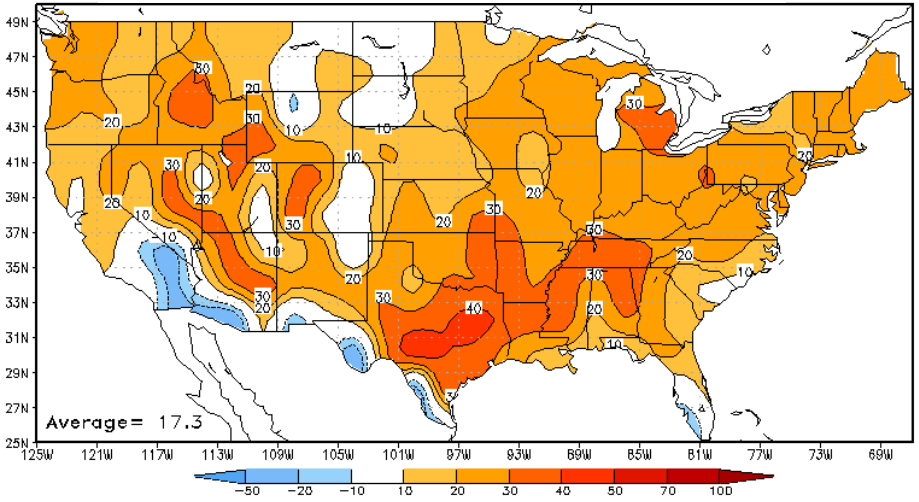
## Winter



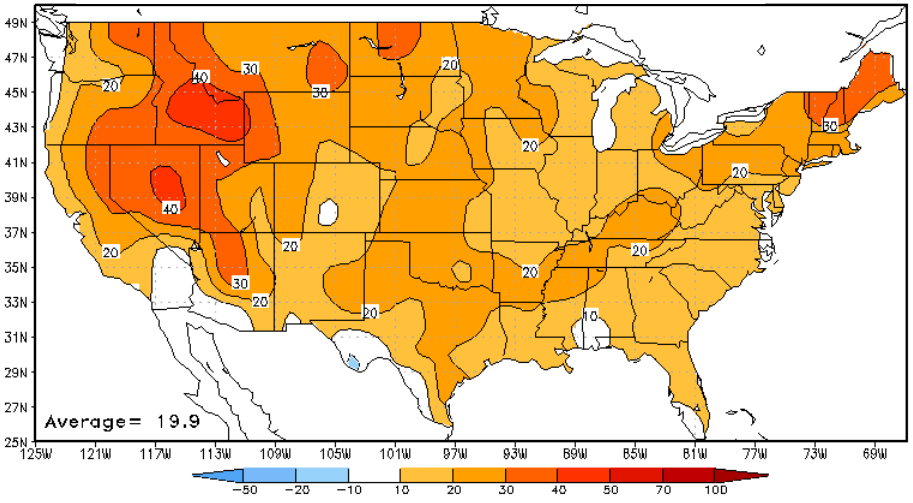

## Spring




## Summer

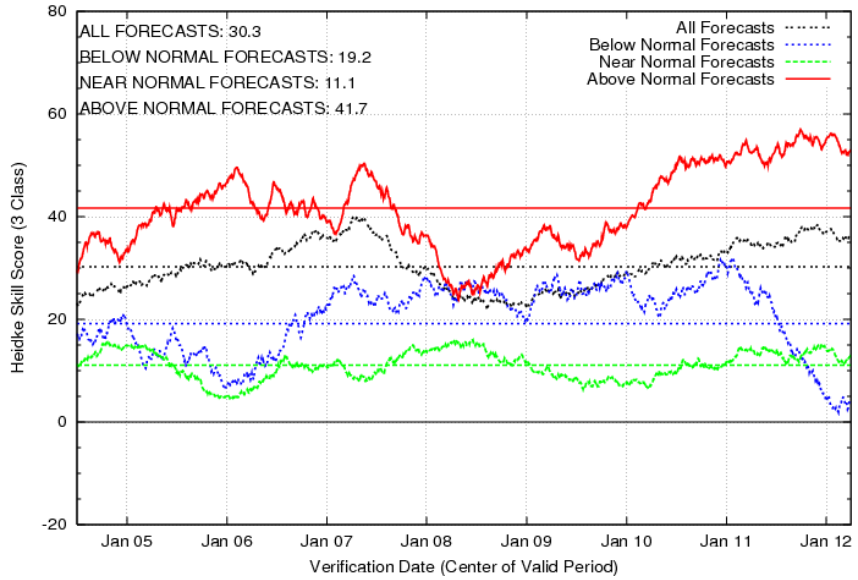



## Fall

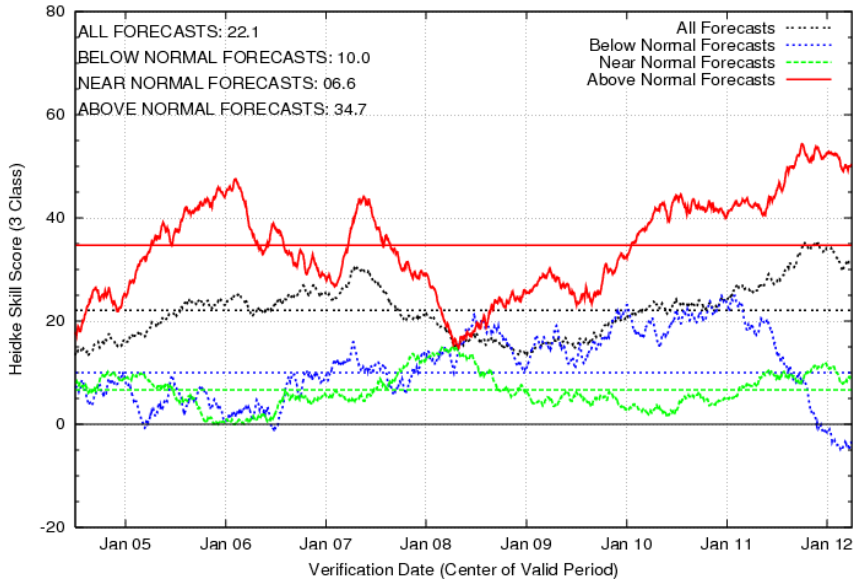


# Forecast Skill (By Category)

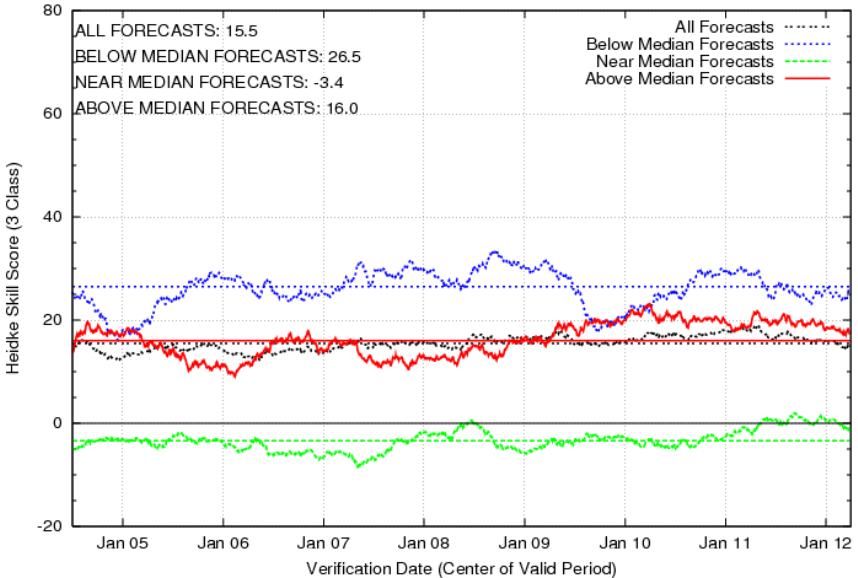
## 6-10 Day Temperature



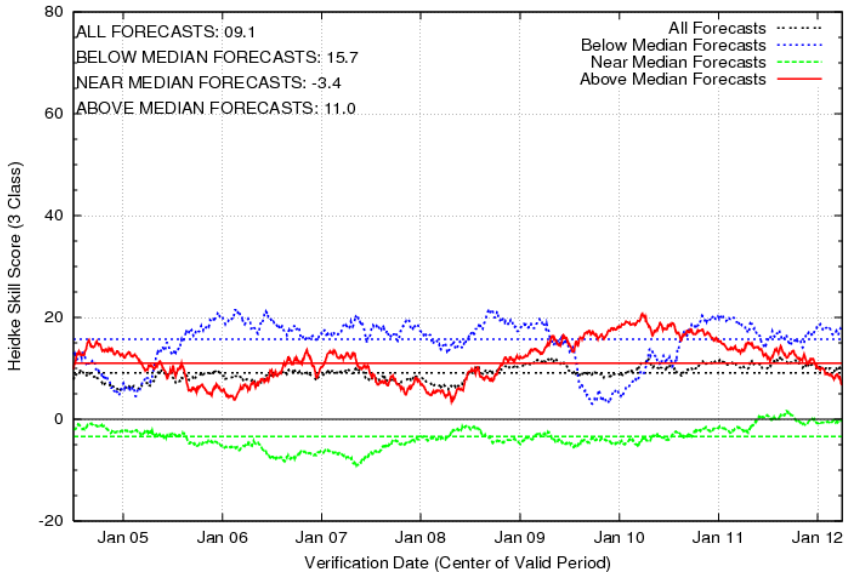

## 8-14 Day Temperature



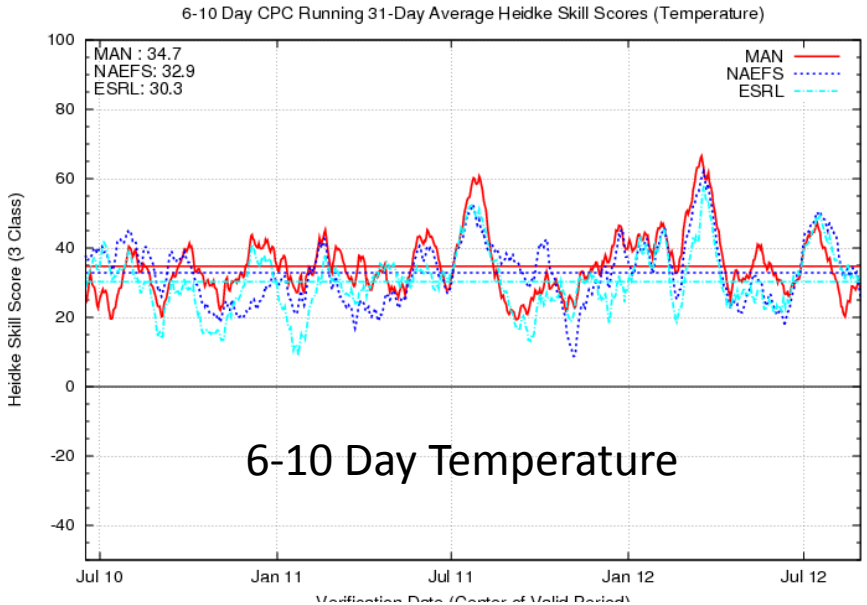

## 6-10 Day Precipitation

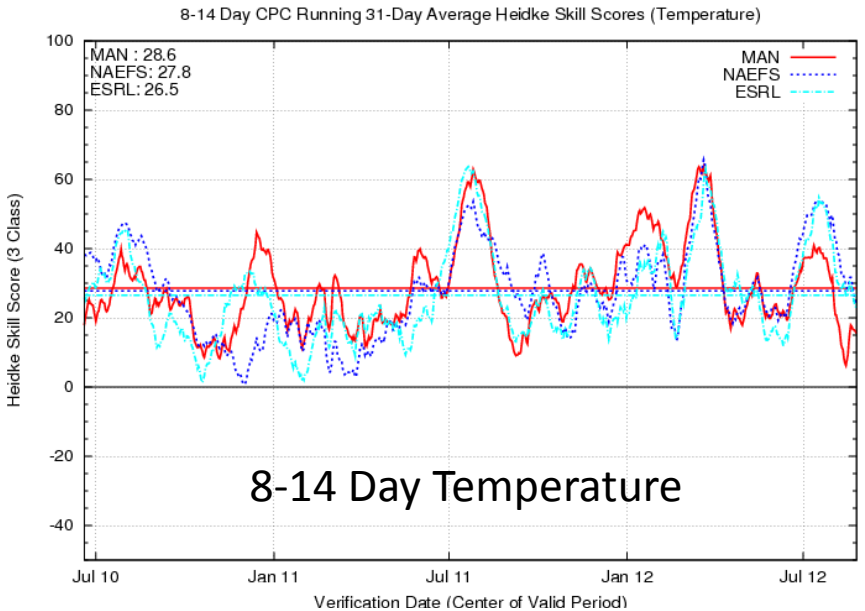


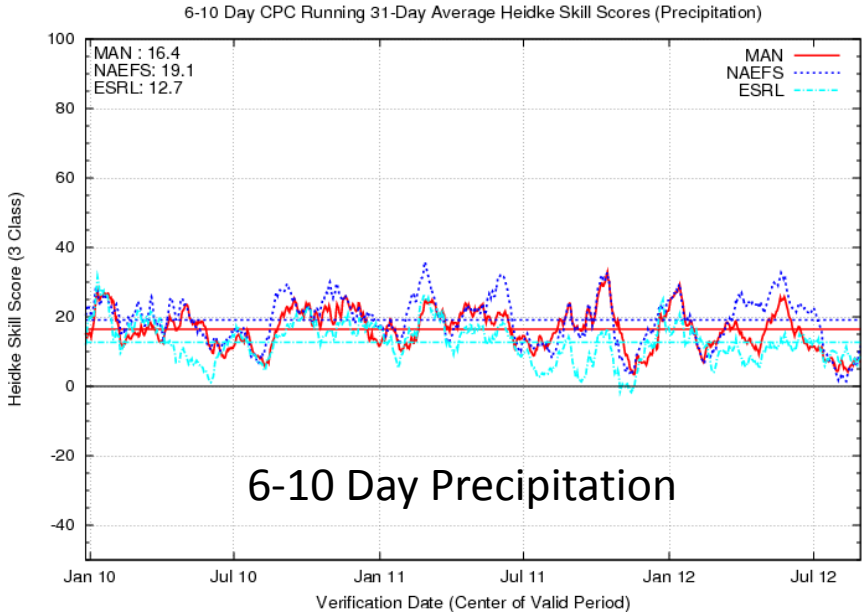

## 8-14 Day Precipitation

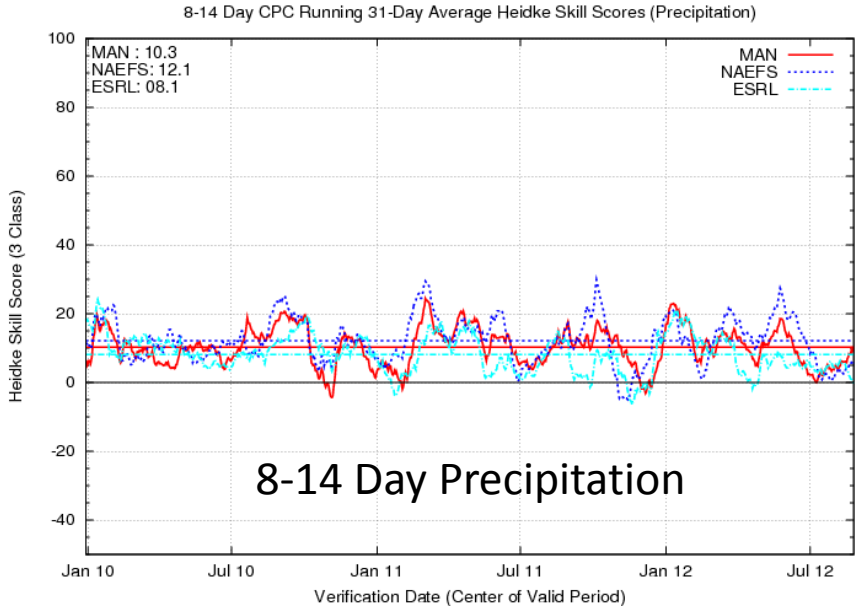


# CPC Official Forecasts vs Tools (2010-2012)



# Public Resources (Current)

## Forecast Archives

**CPC 6-10 & 8-14 Day Data & Graphics Archive**

Available from December 2001

| | |
|---|---|
| Enter Year of Forecast Issuance (yyyy format): | |
| Enter Month of Forecast Issuance (mm format): | |
| Enter Day of Forecast Issuance (dd format): | |

Submit Query

### Forecast Data

PARM=TBLW;TNRM;TABV;TCAT;PBLW;PNRM;PABV;PCAT

| STN | YYMMDD/HHMM | TBLW | TNRM | TABV | TCAT |
|---|---|---|---|---|---|
| 69002 | 120519/0000 | 28.81 | 42.38 | 28.81 | 2.00 |
| 69007 | 120519/0000 | 28.77 | 42.47 | 28.77 | 2.00 |
| 69008 | 120519/0000 | 28.90 | 42.19 | 28.90 | 2.00 |
| 69012 | 120519/0000 | 31.40 | 37.21 | 31.40 | 2.00 |
| 69013 | 120519/0000 | 28.88 | 33.33 | 37.79 | 3.00 |
| 69014 | 120519/0000 | 30.53 | 38.94 | 30.53 | 2.00 |
| 69016 | 120519/0000 | 30.49 | 39.02 | 30.49 | 2.00 |
| 69017 | 120519/0000 | 30.73 | 38.53 | 30.73 | 2.00 |
| 69019 | 120519/0000 | 31.24 | 37.53 | 31.24 | 2.00 |
| 70026 | 120519/0000 | 25.73 | 33.33 | 40.94 | 3.00 |
| 70063 | 120519/0000 | 20.25 | 33.33 | 46.42 | 3.00 |
| 70086 | 120519/0000 | 19.82 | 33.33 | 46.85 | 3.00 |
| 70133 | 120519/0000 | 28.24 | 33.33 | 38.43 | 3.00 |

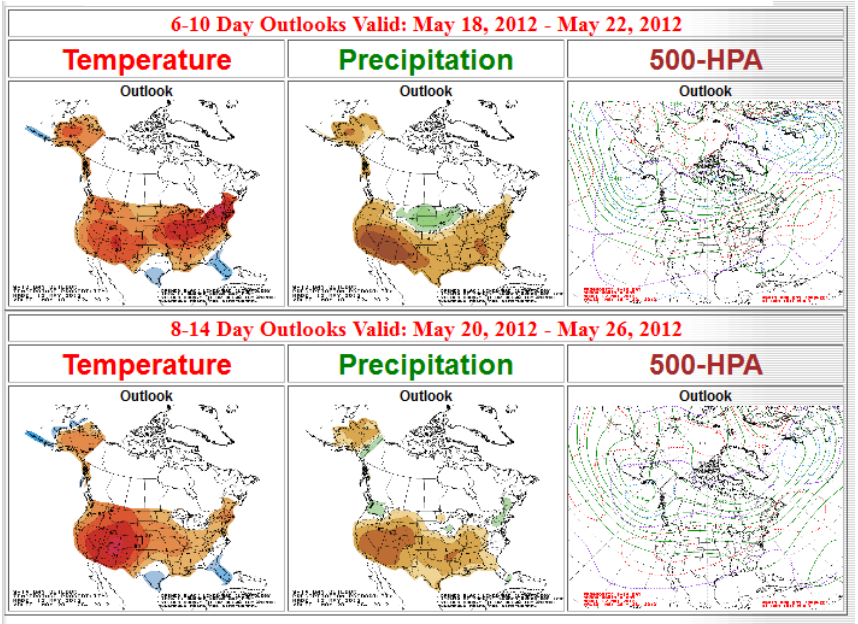
### Prognostic Map Discussion

```
PROGNOSTIC DISCUSSION FOR 6 TO 10 AND 8 TO 14 DAY OUTLOOKS
NWS CLIMATE PREDICTION CENTER CAMP SPRINGS, MD
300 PM EDT FRI MAY 11 2012

6-10 DAY OUTLOOK FOR MAY 17 - 21 2012

TODAYS ENSEMBLE MEAN SOLUTIONS ARE IN GOOD AGREEMENT FEATURING A
THE SOUTHEAST COAST, A POSITIVELY-TILTED TROUGH ACROSS THE WESTER
TROUGH OVER THE BERING SEA WITH A DOWNSTREAM RIDGE OVER CENTRAL A
OPERATIONAL 6Z GFS DEPICTS A DEEP, CLOSED 500-HPA LOW OVER THE MI
WHICH IS CONSIDERED AN OUTLIER SOLUTION. THE OPERATIONAL 0Z ECMWF
THE RIDGE OVER THE NORTHEAST PACIFIC AND ALASKA, WHICH IS NOT SUP
ENSEMBLE MEAN AND OTHER OPERATIONAL MODEL RUNS. ALL ENSEMBLE MEAN
DEPICT A LARGE POSITIVE 500-HPA HEIGHT ANOMALY CENTER OVER SOUTHE
```

### Forecast Maps



# Public Resources (Coming Soon)

## Forecast Verification

**Options**

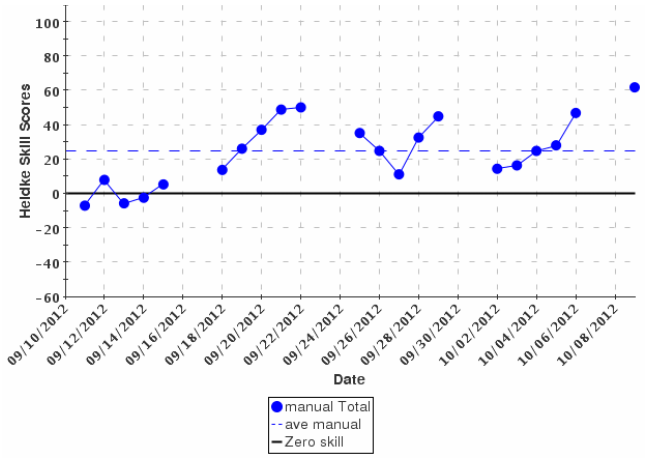
Field [?] temperature

Period [?] 6-10 Day Period

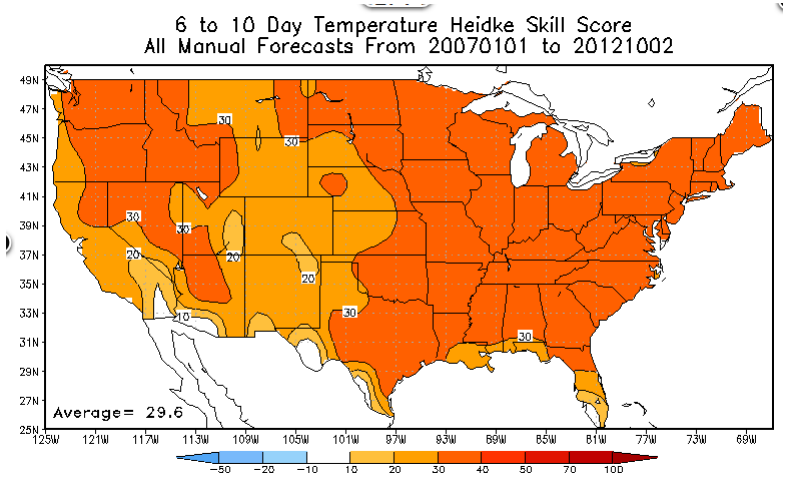
Skill Score [?] heidke

Get scores

### Time Series Plots



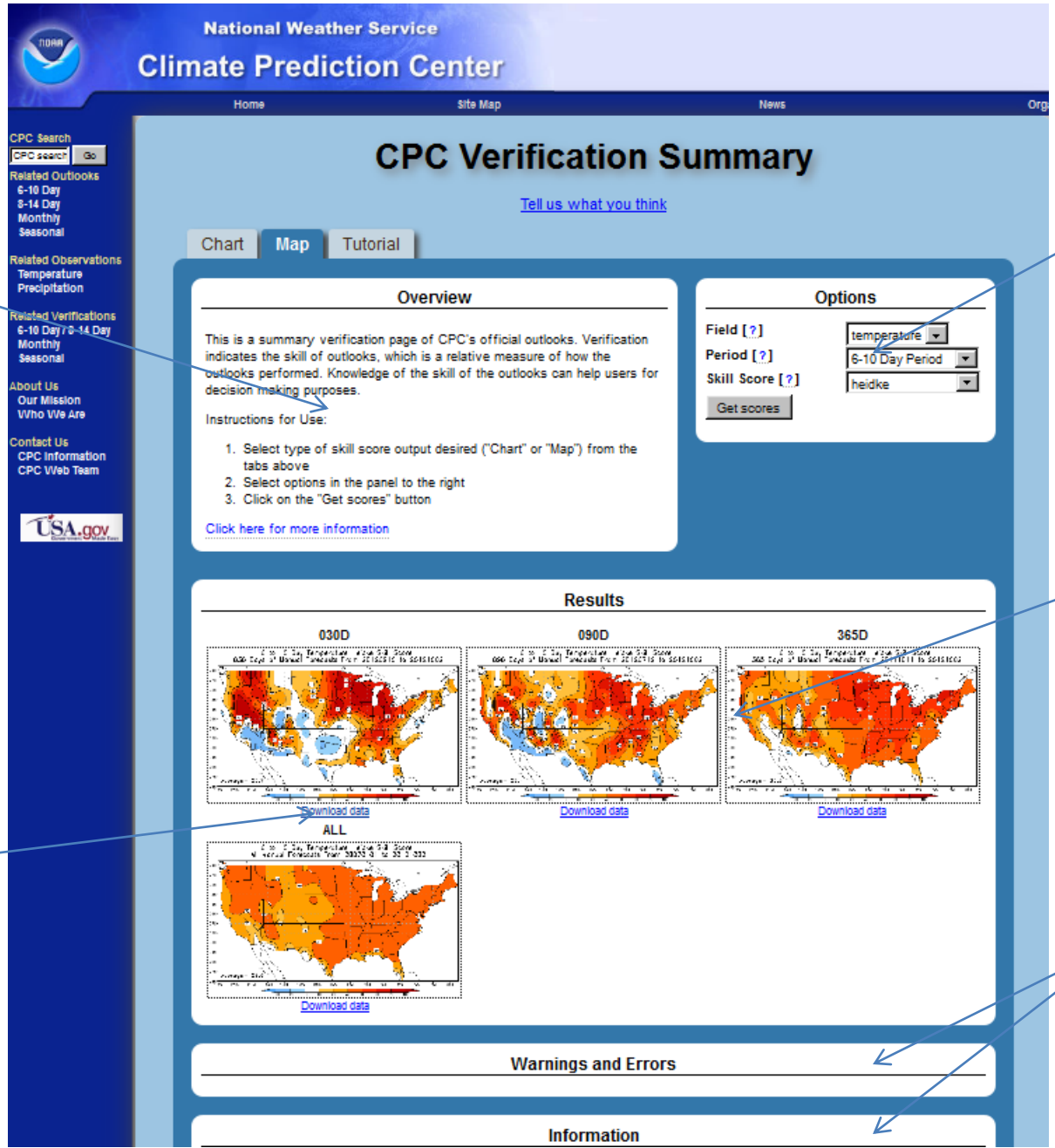

### Skill Maps




### Verification Data

| id | lat | lon | Forecast_Source | all_cats | Percent_Val |
|---|---|---|---|---|---|
| 0411 | 40 | -124 | manual | -14.29 | 100.0% |
| 0412 | 42 | -124 | manual | 7.14 | 100.0% |
| 0413 | 44 | -124 | manual | 7.14 | 100.0% |
| 0414 | 46 | -124 | manual | 0.0 | 100.0% |
| 0415 | 48 | -124 | manual | 0.0 | 100.0% |
| 0509 | 36 | -122 | manual | 35.71 | 100.0% |
| 0510 | 38 | -122 | manual | 7.14 | 100.0% |
| 0511 | 40 | -122 | manual | 14.29 | 100.0% |
| 0512 | 42 | -122 | manual | 28.57 | 100.0% |
| 0513 | 44 | -122 | manual | 28.57 | 100.0% |
| 0514 | 46 | -122 | manual | 21.43 | 100.0% |
| 0515 | 48 | -122 | manual | 21.43 | 100.0% |
| 0608 | 34 | -120 | manual | -7.14 | 100.0% |
| 0609 | 36 | -120 | manual | 0.0 | 100.0% |
| 0610 | 38 | -120 | manual | 50.0 | 100.0% |
| 0611 | 40 | -120 | manual | 78.57 | 100.0% |
| 0612 | 42 | -120 | manual | 78.57 | 100.0% |
| 0613 | 44 | -120 | manual | 71.43 | 100.0% |
| 0614 | 46 | -120 | manual | 28.57 | 100.0% |

# Verification Page Screenshot




Overview Panel

Options Panel

Results Panel

Data Access

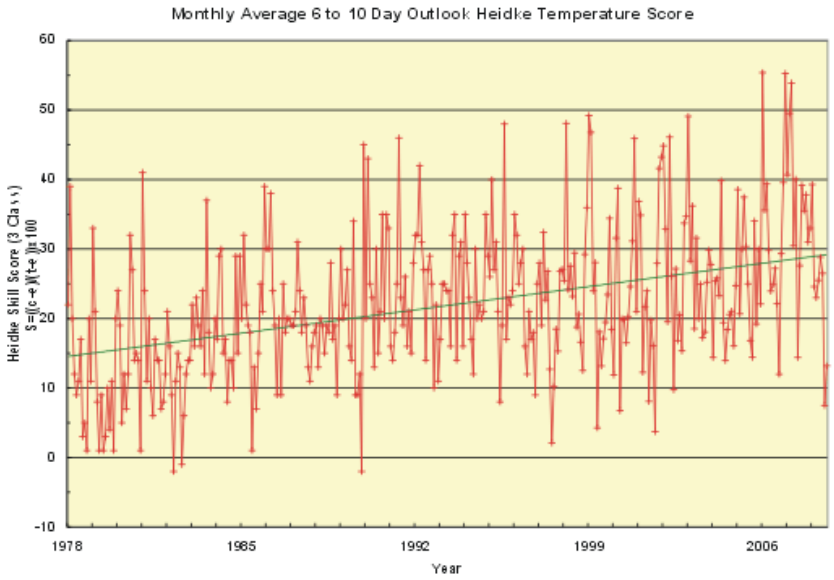
Error and Information Panels

# Summary/Conclusions

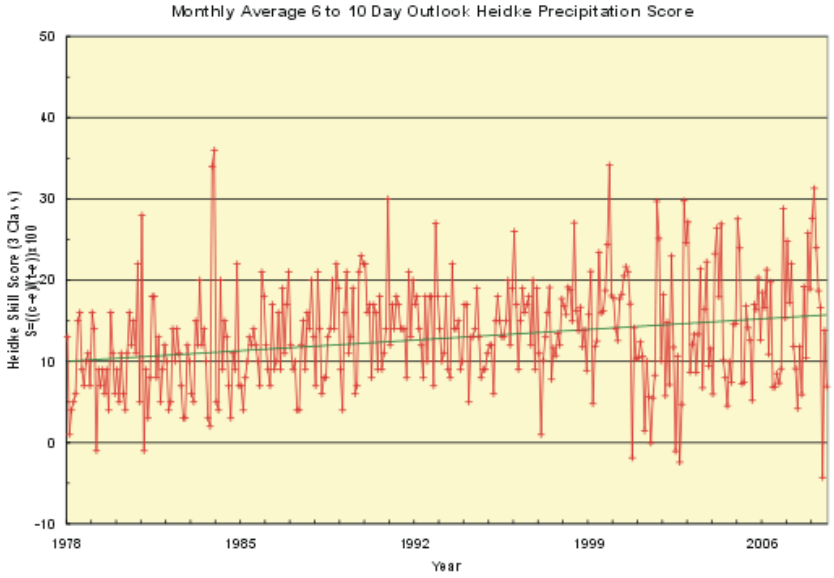
- Skill has been overwhelmingly positive during the study period and has generally been improving over the past 3 years
- Skill varies by season with the highest values in winter. However, skill has been more consistent across seasons during the last 3 years
- Temperature skill has been positive across all areas with the highest skill for the east during winter and spring and over the northwest in the fall
- Forecast probabilities have generally been too low
- Additional verification resources will be available to the public soon increasing transparency and allowing the ability to verify forecasts in real time

# Backup Slides

# Long Term Skill of 6-10 Day Outlooks (1978-2008)

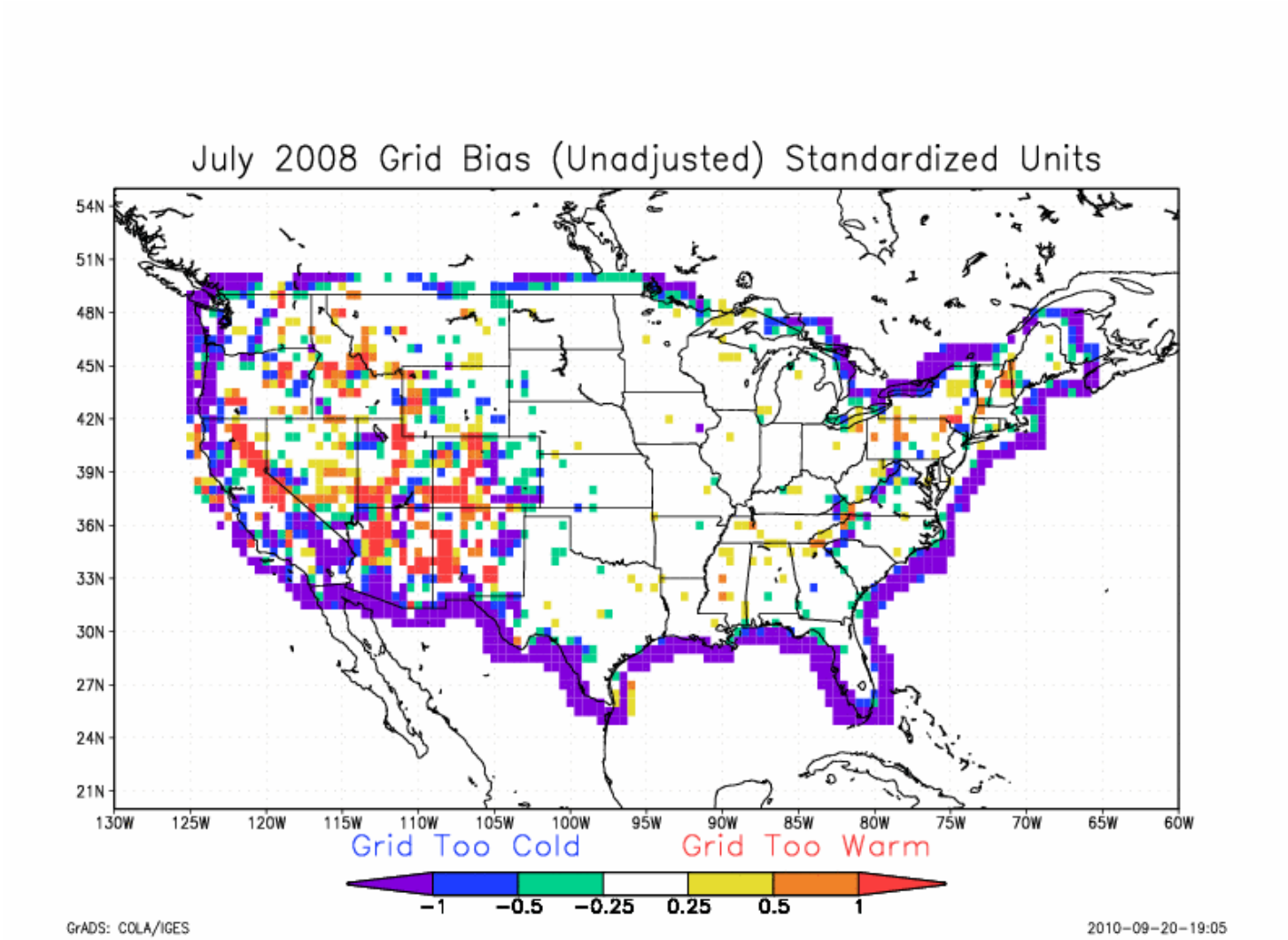



6-10 Day Temperature



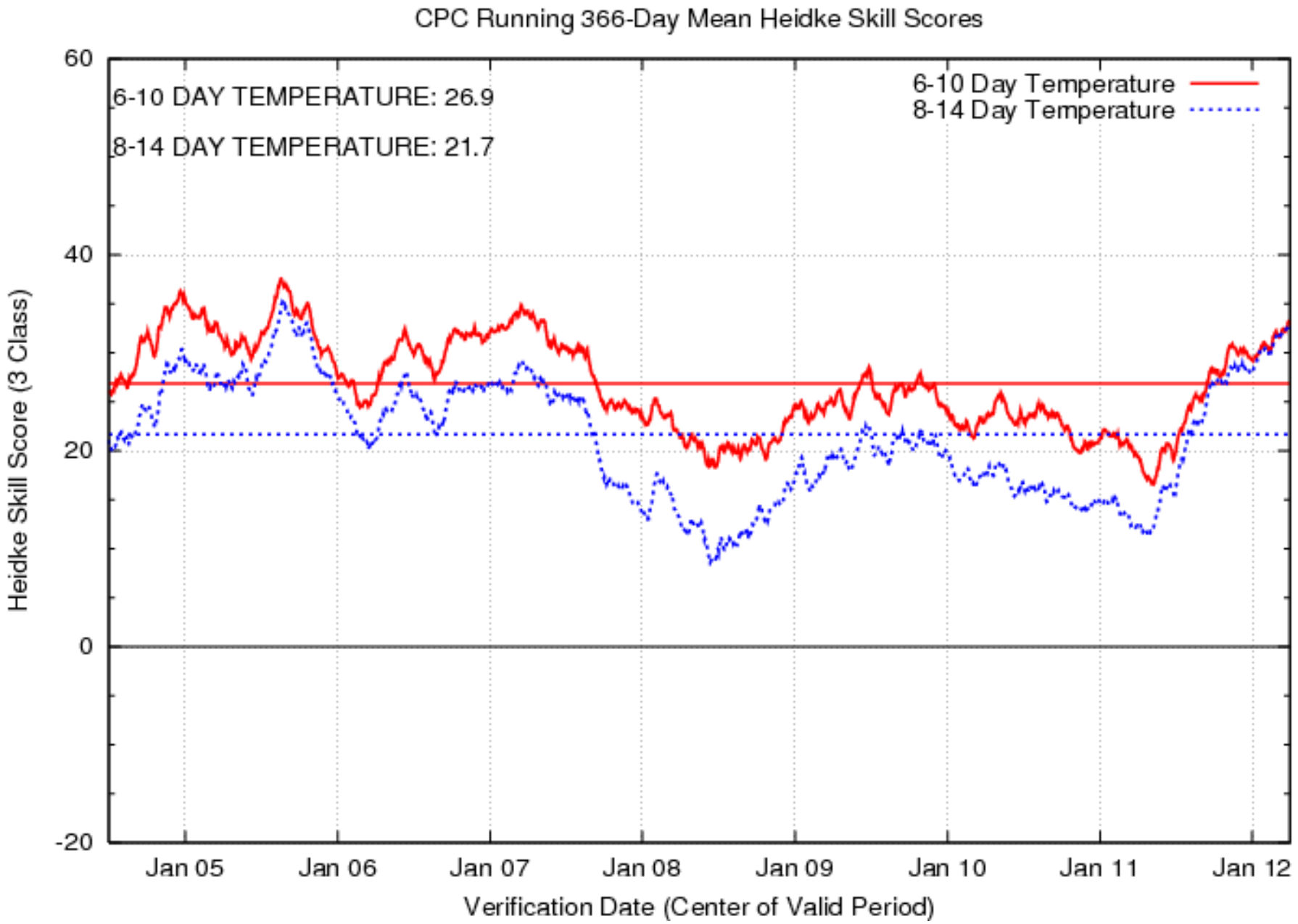

6-10 Day Precipitation

# Gridded Observation Biases




Courtesy: David Unger

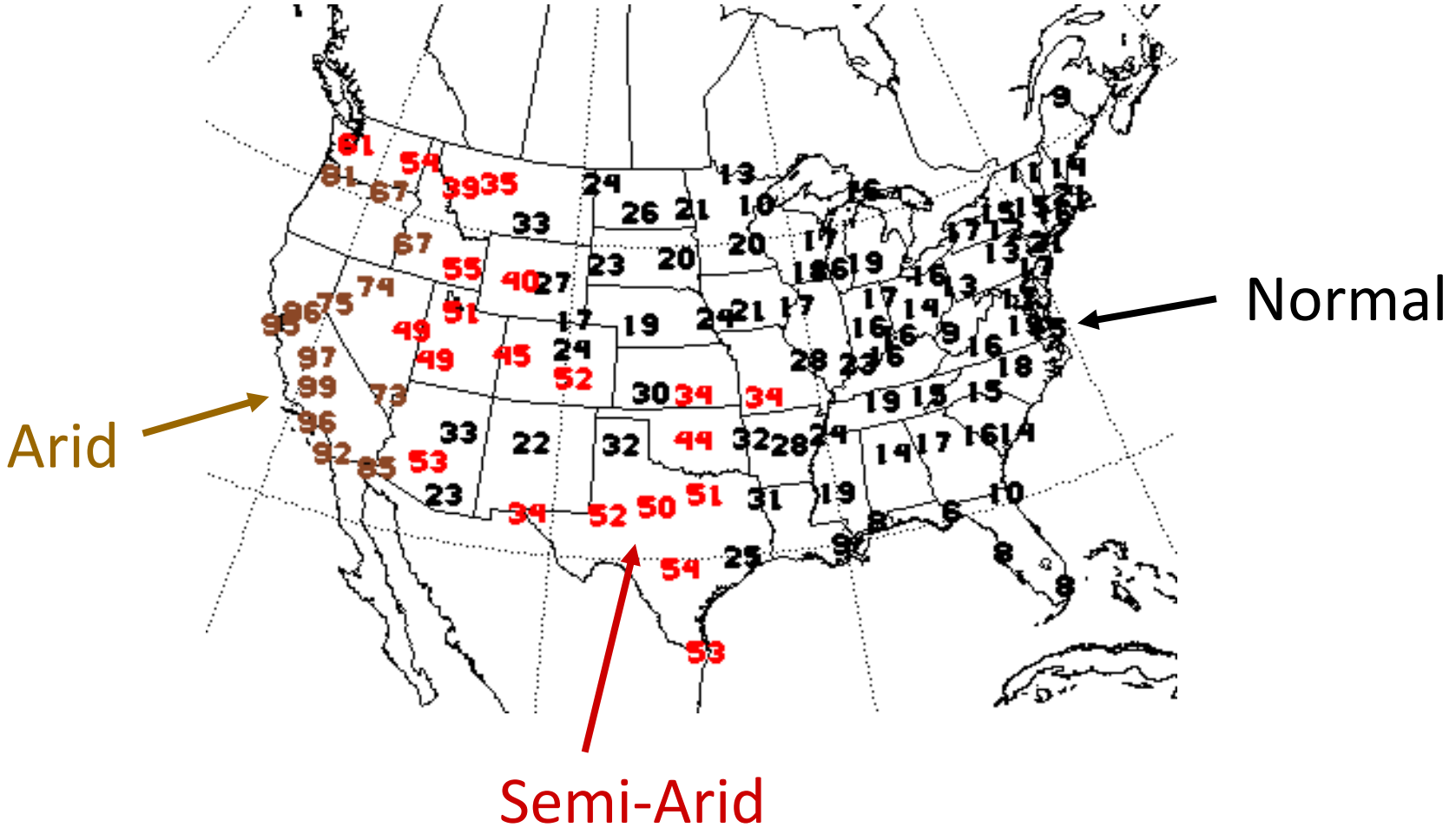
# Overview of ERF Alaska Temperature Skill (2004-2012)



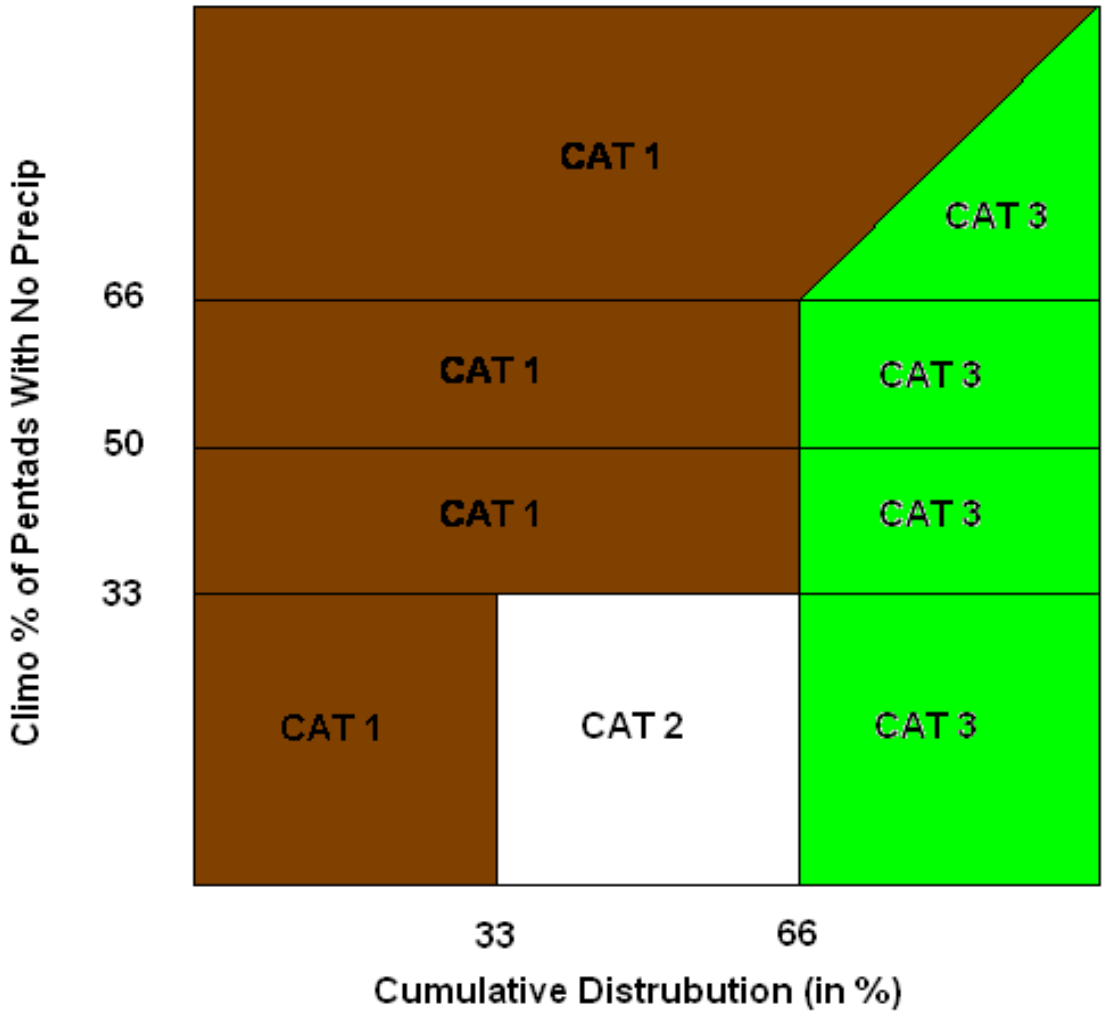
# The “Dry Station” Problem

Percentage of Pentads with No Precipitation

(JULY)



# Precipitation Categorization Scheme




Arid

Semi-Arid

Normal